AHRQ Healthcare Horizon Scanning System – Potential High-Impact Interventions Report

Crosscutting Interventions and Programs

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www.ahrq.gov

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Prepared by:
ECRI Institute
5200 Butler Pike
Plymouth Meeting, PA 19462

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Statement of Funding and Purpose

This report incorporates data collected during implementation of the Agency for Healthcare Research and Quality (AHRQ) Healthcare Horizon Scanning System by ECRI Institute under contract to AHRQ, Rockville, MD (Contract No. HHSA290201000006C). The findings and conclusions in this document are those of the authors, who are responsible for its content, and do not necessarily represent the views of AHRQ. No statement in this report should be construed as an official position of AHRQ or of the U.S. Department of Health and Human Services.

This report's content should not be construed as either endorsements or rejections of specific interventions. As topics are entered into the System, individual topic profiles are developed for technologies and programs that appear to be close to diffusion into practice in the United States. Those reports are sent to various experts with clinical, health systems, health administration, and/or research backgrounds for comment and opinions about potential for impact. The comments and opinions received are then considered and synthesized by ECRI Institute to identify interventions that experts deemed, through the comment process, to have potential for high impact. Please see the methods section for more details about this process. This report is produced twice annually and topics included may change depending on expert comments received on interventions issued for comment during the preceding 6 months.

A representative from AHRQ served as a Contracting Officer's Technical Representative and provided input during the implementation of the horizon scanning system. AHRQ did not directly participate in horizon scanning, assessing the leads for topics, or providing opinions regarding potential impact of interventions.

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Financial Disclosure Statement

None of the individuals compiling this information has any affiliations or financial involvement that conflicts with the material presented in this report.

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Preface

The purpose of the AHRQ Healthcare Horizon Scanning System is to conduct horizon scanning of emerging health care technologies and innovations to better inform patient-centered outcomes research investments at AHRQ through the Effective Health Care Program. The Healthcare Horizon Scanning System provides AHRQ a systematic process to identify and monitor emerging technologies and innovations in health care and to create an inventory of interventions that have the highest potential for impact on clinical care, the health care system, patient outcomes, and costs. It will also be a tool for the public to identify and find information on new health care technologies and interventions. Any investigator or funder of research will be able to use the AHRQ Healthcare Horizon Scanning System to select potential topics for research.

The health care technologies and innovations of interest for horizon scanning are those that have yet to diffuse into or become part of established health care practice. These health care interventions are still in the early stages of development or adoption, except in the case of new applications of already-diffused technologies. Consistent with the definitions of health care interventions provided by the Institute of Medicine and the Federal Coordinating Council for Comparative Effectiveness Research, AHRQ is interested in innovations in drugs and biologics, medical devices, screening and diagnostic tests, procedures, services and programs, and care delivery.

Horizon scanning involves two processes. The first is identifying and monitoring new and evolving health care interventions that are purported to or may hold potential to diagnose, treat, or otherwise manage a particular condition or to improve care delivery for a variety of conditions. The second is analyzing the relevant health care context in which these new and evolving interventions exist to understand their potential impact on clinical care, the health care system, patient outcomes, and costs. It is NOT the goal of the AHRQ Healthcare Horizon Scanning System to make predictions on the future use and costs of any health care technology. Rather, the reports will help to inform and guide the planning and prioritization of research resources.

We welcome comments on this Potential High Impact report. Send comments by mail to the Task Order Officer named in this report to: Agency for Healthcare Research and Quality, 540 Gaither Road, Rockville, MD 20850, or by email to: effectivehealthcare@ahrq.hhs.gov.

Carolyn M. Clancy, M.D.
Director
Agency for Healthcare Research and Quality

Jean Slutsky, P.A., M.S.P.H.
Director, Center for Outcomes and Evidence
Agency for Healthcare Research and Quality

Elise Berliner, Ph.D.
Task Order Officer
Center for Outcomes and Evidence
Agency for Healthcare Research and Quality

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Background

Horizon scanning is an activity undertaken to identify technological and system innovations that could have important impacts or bring about paradigm shifts. In the health care sector, horizon scanning pertains to identification of new (and new uses of existing) pharmaceuticals, medical devices, diagnostic tests and procedures, therapeutic interventions, rehabilitative interventions, behavioral health interventions, and public health and health promotion activities. In early 2010, the Agency for Healthcare Research and Quality (AHRQ) identified the need to establish a national Healthcare Horizon Scanning System to generate information to inform comparative-effectiveness research investments by AHRQ and other interested entities. AHRQ makes those investments in 14 priority areas. For purposes of horizon scanning, AHRQ's interests are broad and encompass drugs, devices, procedures, treatments, screening and diagnostics, therapeutics, surgery, programs, and care delivery innovations that address unmet needs. Thus, we refer to topics identified and tracked in the AHRQ Healthcare Horizon Scanning System generically as "interventions." The AHRQ Healthcare Horizon Scanning System implementation of a systematic horizon scanning protocol (developed between September 1 and November 30, 2010) began on December 1, 2010. The system is intended to identify interventions that purport to address an unmet need and are up to 7 years out on the horizon and then to follow them for up to 2 years after initial entry into the health care system. Since that implementation, review of more than 15,000 leads about potential topics has resulted in identification and tracking of about 1,600 topics across the 14 AHRQ priority areas and 1 cross-cutting area; about 950 topics are being actively tracked in the system.

Methods

As part of the Healthcare Horizon Scanning System activity, a report on interventions deemed as having potential for high impact on some aspect of health care or the health care system (e.g., patient outcomes, utilization, infrastructure, costs) is aggregated quarterly. Topics eligible for inclusion are those interventions expected to be within 0–4 years of potential diffusion (e.g., in phase III trials or for which some preliminary efficacy data in the target population are available) in the United States or that have just begun diffusing and that have completed an expert feedback loop.

The determination of impact is made using a systematic process that involves compiling information on topics and issuing topic drafts to a small group of various experts (selected topic by topic) to gather their opinions and impressions. Those impressions are used to determine potential impact. Information is compiled for expert comment on topics at a granular level (i.e., similar drugs in the same class are read separately), and then topics in the same class of a device, drug, or biologic are aggregated for discussion and impact assessment at a class level for this report. The process uses a topic-specific structured form with text boxes for comments and a scoring system (1 minimal to 4 high) for potential impact in seven parameters. Participants are required to respond to all parameters.

The scores and opinions are then synthesized to discern those topics deemed by experts to have potential for high impact in one or more of the parameters. Experts are drawn from an expanding database ECRI Institute maintains of approximately 350 experts nationwide who were invited and agreed to participate. The experts comprise a range of generalists and specialists in the health care sector whose experience reflects clinical practice, clinical research, health care delivery, health business, health technology assessment, or health facility administration perspectives. Each expert uses the structured form to also disclose any potential intellectual or financial conflicts of interest

(COIs). Perspectives of an expert with a COI are balanced by perspectives of experts without COIs. No more than two experts with a possible COI are considered out of a total of the seven or eight experts who are sought to provide comment for each topic. Experts are identified in the system by the perspective they bring (e.g., clinical, research, health systems, health business, health administration, health policy).

The topics included in this report had scores *and/or* supporting rationales at or above the overall average for all topics in this priority area that received comments by experts. Of key importance is that topic scores alone are not the sole criterion for inclusion—experts' rationales are the main drivers for the designation of potentially high impact. We then associated topics that emerged as having potentially high impact with a further subcategorization of "lower," "moderate," or "higher." As the Healthcare Horizon Scanning System grows in number of topics on which expert opinions are received, and as the development status of the interventions changes, the list of topics designated as having potentially high impact is expected to change over time.

For additional details on methods, please refer to the full AHRQ Healthcare Horizon Scanning System Protocol and Operations Manual published on AHRQ's Effective Health Care Web site.

Results

The table below lists five topics for which (1) phase II or III data for devices and procedures or some human data for programs were available; (2) information was compiled by September 21, 2012, in this priority area; *and* (3) we received six to nine sets of comments from experts between December 2011 and October 19, 2012. (Thirteen topics in this priority area were being tracked in the system as of October 26, 2012.) We present summaries on five topics (indicated below by an asterisk) that emerged as having potentially high impact based on experts' comments and their assessment of potential impact. The material on interventions in this Executive Summary and report is organized alphabetically. Readers are encouraged to read the detailed information on each intervention that follows the Executive Summary.

Priority Area 15: Crosscutting Interventions and Programs

Topic	High-Impact Potential
1. * Community paramedicine to improve care access in rural areas	High
2. * Intelligent pills (The Raisin System) to monitor patient medication adherence	Lower end of the potential high-impact range
3. * Medical homes network to link patients in emergency departments to community care	Moderately high
4. * Partnering urban specialists with rural primary care clinicians for treatment of complex, chronic conditions	High
5. * Senior-specific emergency departments for treatment of elderly patients	Lower end of the potential high-impact range

Discussion

We created a priority area to capture crosscutting interventions that affect two or more of AHRQ's 14 priority areas. Some of these interventions are health care technologies and others are programs, services, or care-delivery innovations.

Community Paramedicine to Improve Care Access in Rural Areas

- **Key Facts:** For many reasons, primary care access in rural and remote regions is limited, and this shortage can prompt patients to inappropriately use emergency medical services

(EMS) and ambulance transport to the emergency department (ED). This is especially a problem with nonemergency medical issues, home-health or social-service conditions, and medical issues that could have been prevented if the patient had had regular access to primary care. The community paramedicine model uses EMS personnel (paramedics) to provide specific primary care services in a patient's home, with the ultimate goal of improving health outcomes among medically vulnerable populations and reducing unnecessary ambulance transports, ED visits, and hospital readmissions. Several versions of this model are being implemented in the United States, and we describe one of those models in this report. The community paramedicine model is not intended to replace current home-health services; rather, it is intended to provide a means of extending the reach of primary care providers to patients who lack access to these services.

- **Key Expert Comments:** Experts thought that this model could successfully meet the need for improving primary care access in rural areas. Experts expected to see the program's most dramatic effects in reduced health care costs, improved health disparities, and better patient management and health outcomes.
- **Potential for High Impact:** High

Intelligent Pills (The Raisin System) to Monitor Patient Medication Adherence

- **Key Facts:** The Raisin System™ (Proteus Biomedical, Inc., Redwood City, CA), a form of smart-pill technology, is being investigated to treat chronic diseases requiring ongoing medication, such as tuberculosis, diabetes, heart failure, AIDS, hepatitis C virus infection, and mental health disorders. An ingestible sensor (formerly known as an Ingestible Event Marker or IEM), affixed to conventional pharmaceuticals (i.e., pills), a personal monitor, and a Bluetooth-enabled data device such as a cell phone comprise the system. Digestive fluids activate the ingestible sensor, made from common food ingredients, when the sensor reaches the stomach. The personal monitor is a miniaturized, battery-operated, data-logging device that patients wear as a patch on the torso to record heart rate, activity, ingestion of monitored medications, and patient-logged events such as symptoms. When a patient ingests a monitored pill, the activated ingestible sensor transmits its unique signature to the personal monitor, which records and timestamps the event along with physiologic data such as heart rate. The personal monitor transmits collected patient data to the patient's Bluetooth-enabled cell phone or other computerized device. Data are then encrypted and forwarded to a secure database that clinicians can access to review the patient's condition. In results of a trial of 111 patients who ingested 7,144 monitored pills, investigators reported that the system's positive and negative ingestible-marker detection accuracy was more than 97%, and medication adherence was more than 85%. The most common adverse effect was mild skin rash from the monitor's electrodes; no serious adverse events were reported. The company received marketing clearance from the U.S. Food and Drug Administration for the monitoring device in March 2010 and received marketing clearance for the ingestible sensor in July 2012.
- **Key Expert Comments:** Experts commenting on this topic agreed that this technology could have a significant impact on many health system parameters, although some of the experts were skeptical about this intervention's potential to actually improve medication adherence and health outcomes. Experts believe patient acceptance of the marked pills would be low, although one expert thought that elderly patients living alone would be more

likely to adopt this technology. Experts also thought clinician acceptance would be low because the technology might increase time and infrastructure needed for clinicians to review data and alter patient management as a result.

- **Potential for High Impact:** Lower end of the potential high-impact range

Medical Homes Network to Link Patients in Emergency Departments to Community Care

- **Key Facts**: The University of Chicago's South Side Medical Homes (SMH) Network is intended to link patients who overuse or misuse the ED with community-based primary care providers. In the ED, patient advocates identify patients who do not have a regular primary care provider in the community and assist them in setting up a primary care referral with collaborating community clinics. If the patient accepts the referral, appointments are scheduled either immediately or during a followup phone call. To maintain continuity of care, patient ED medical information is either faxed to the community clinic or shared electronically through a recently developed ED Community Portal that allows community physicians to access medical records of patients referred from the ED. Some of the partnering community health centers reserve certain appointment slots for SMH-referred patients. Experts viewed this program as having significant impact because of the sizable burden of ED overcrowding and underutilization of primary care services.
- **Key Expert Comments**: Experts suggested that this program might have particularly high impact in improving health disparities and shifting patient care from the ED to the primary setting. However, most experts noted that patient adherence to the program will be necessary for it to reach its full potential.
- **Potential for High Impact**: Moderately high

Partnering Urban Specialists with Rural Primary Care Clinicians for Treatment of Complex, Chronic Conditions

- **Key Facts**: Project ECHO™ (Extension for Community Healthcare Outcomes, developed at the University of New Mexico Health Sciences Center, Albuquerque), is intended to improve access to specialty care by aiding primary care clinicians in rural or underserved areas to develop more capacity to safely and effectively manage patients in their communities who have chronic, common, and complex diseases. The program uses telehealth technology and clinical management tools to train and support rural primary care providers in developing knowledge about diseases that would typically fall within the realm of specialty care. A specialist (e.g., from an academic medical center) guides a primary care provider in developing the skills and self-efficacy necessary to treat the patient. Additionally, during case-based teleclinics, ECHO specialists make brief didactic presentations that are typically relevant to specific issues that arise, with these presentations intended to improve content knowledge. Finally, patient outcomes are monitored through a centralized database. Project ECHO is being studied for its ability to improve management of patients with hepatitis C virus infection or other chronic conditions.
- **Key Expert Comments**: Experts commenting on this topic agreed that this intervention is intended to fill an important gap and is likely to have a significant impact on patient management models and access to care in rural areas, although some skepticism about the model's sustainability existed because of unanswered questions about long-term funding.
- **Potential for High Impact**: High

Senior-Specific Emergency Departments for Treatment of Elderly Patients

- **Key Facts**: Some hospitals are now offering EDs designed to cater specifically to the special needs of the senior population to improve safety, outcomes, and quality of care for elderly patients in the ED. Senior-specific EDs offer equipment such as reclining chairs and padded or lined stretchers to improve patient comfort and reduce risk of pressure ulcers; large-faced clocks for better visibility; calendars and boards with the names of hospital and clinical staff to reduce risk of patient disorientation and delirium; fall-prevention design such as nonskid floor surfaces, extra handrails, more aisle lighting, and bedside commodes; and visual and lighting aids. Protocol-based patient care interventions include screening for cognitive impairment and delirium as part of routine practice, adopting minimal use of urethral catheters and other "tethering" devices to reduce patient immobility and risk for nosocomial infection and delirium, and creating a staff position for a nursing discharge coordinator to assess the patient's postdischarge care situation and needs.
- **Key Expert Comments**: Experts agreed that the need for senior-specific ED care represents an important unmet need and that this model might improve outcomes and health disparities in the target population. Experts had differing opinions about whether this model would be a positive change because of a paucity of outcomes data at this time.
- **Potential for High Impact**: Lower end of the potential high-impact range

Crosscutting Interventions and Programs

Community Paramedicine to Improve Care Access in Rural Areas

Primary care access in rural and remote regions is limited by physician shortages, hospital and clinic closures and mergers, limited public transportation, vulnerable aging populations, increasing cultural and ethnic diversity, economic disadvantage, and poor health status.[1,2] Limited access to primary care can prompt patients to inappropriately use emergency medical services (EMS) and ambulance transport to the emergency department (ED) for nonemergencies, home-health or social-service issues, and medical issues that could have been prevented if the patient had had regular access to primary care.[2]

The community paramedicine model may close the primary-care-access gap by using EMS personnel to augment available services.[1] In community paramedicine, EMS personnel (paramedics) provide specific primary care services in a patient's home when EMS personnel are not on emergency calls.[2] The reader should note that this report describes one program in particular (Community Paramedic Program, Western Eagle County, CO), but several other community paramedicine models have been implemented recently across the United States. Although certain aspects of each of these programs differ, their underlying frameworks are similar.

The goals of the Western Eagle County Ambulance District (WECAD) community paramedicine program are to "improve health outcomes among medically vulnerable populations and to save healthcare dollars by preventing unnecessary ambulance transports, [ED] visits, and hospital readmissions."[2] According to the program handbook, the community paramedicine model has two components: primary care services (ordered by a physician and conducted in a patient's home) and community-based prevention services (planned and provided in conjunction with the local public health department).[2]

In the WECAD program, these components are carried out by EMS workers, who have a lot of downtime between emergency calls.[3] During the downtime, EMS workers visit patient homes and provide specific primary care services that are within the paramedic's legal scope of practice and skill set. These services may include assessment (vital signs, blood pressure, labs, medication compliance), treatment (wound care, medication reconciliation), prevention (immunizations, fall assessment), and referral (medical and social services). Patients are referred to the program via physician order. Care provided under the WECAD program is not intended as ongoing care management, and each visit requires a separate physician's order. After each visit, the paramedic completes a patient care report and faxes it to the ordering provider for the patient's chart. If the paramedic deems that immediate physician intervention is necessary, he or she calls the ordering physician while at the patient's home. The WECAD program developers note that community paramedicine is not intended to replace current home-health services, such as home-health care rendered by primary care physicians. Instead, the program is intended to be an "extension of the primary care provider to provide care to patients without access."[2]
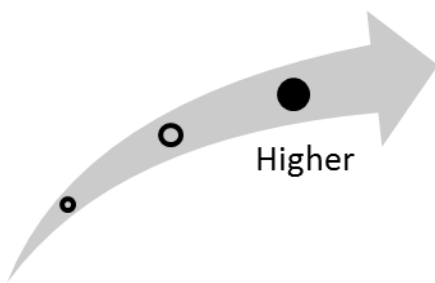
Although no ongoing trials of these paramedicine programs were identified in the National Clinical Trials database, researchers who studied the outcomes of a paramedicine intervention in an England-based trial of 3,018 patients older than 60 years of age concluded that, "Overall, patients in the intervention group were less likely to attend an emergency department (relative risk 0.72, 95% confidence interval 0.68 to 0.75) or require hospital admission within 28 days (0.87, 0.81 to 0.94) and experienced a shorter total episode time (235 v 278 minutes, 95% confidence interval for difference −60 minutes to −25 minutes). Patients in the intervention group were more likely to report being highly satisfied with their healthcare episode (relative risk 1.16, 1.09 to 1.23). There was no significant difference in 28-day mortality (0.87, 0.63 to 1.21)."[4] Costs, funding, and

reimbursement policies vary from program to program. Patients enrolled in the WECAD program are not charged for services; the program is funded by State monies.[3]

Current Approach to Care

EMS personnel are intended to be emergency responders who provide acute care.[2] However, nationwide shortages of primary care physicians often lead to patient use of an EMS to access EDs for routine health care services, despite the fact that a primary care setting would provide patients with more appropriate and cost-effective care.[2,5] Community paramedicine might increase access to primary and preventive care, provide wellness interventions within the medical home model, decrease ED use, save health care costs, and improve patient outcomes.[5]

Figure 1. Overall high-impact potential: community paramedicine to improve care access in rural areas

Experts commenting on this intervention were extremely enthusiastic about this program's potential to address the unmet need for improved provider access in rural areas. Experts thought that this program would have marked effects on health disparities and would be likely to improve patient health outcomes over the long term. Experts also noted that the program would fundamentally alter the way patients are managed and could save costs by reducing unnecessary or inappropriate ED visits and hospital admissions. Based on this input, our overall assessment is that this intervention is in the higher end of the high-potential-impact range.

Results and Discussion of Comments

Six experts, with clinical, research, and health systems backgrounds, offered perspectives on this intervention.[6-11]

Generally, the experts agreed that the unmet need this intervention attempts to address is important because a large number of patients are affected by lack of primary care resources, the associated poor health outcomes, and the costs affiliated with unnecessary emergency medical resource use. Most experts also agreed that this intervention would be successful in meeting this need, although more experts appeared to base this opinion on the theory underlying the intervention than on available trial data. For example, one clinical expert noted, "This program has the potential to offer a bridge to the challenge of accessing fundamental services at lower costs and under safe conditions," and may "significantly improve patient health because it may allow for more frequent monitoring of complex patients and may also offer ready access to some preventive services."[9]

However, one clinical expert suggested that this intervention may not be effective, stating that "EMS and its providers are inappropriate for primary care delivery even under the supervision of a physician. EMS staff are minimally trained professionals and could provide only marginal primary care services."[6] This expert suggested that a preferable strategy would be to expand the availability

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of primary care nurse practitioners, noting that they are "geared toward primary care delivery in a way that EMS is fundamentally inappropriate for."[6]

Experts thought that this intervention's greatest impact would be in improving health disparities by increasing access to primary care. Experts thought this intervention would have notable impacts on the way patients are managed because it would shift care from the ED to a home-care setting, shift responsibility for patient care from emergency physicians and primary care physicians to paramedics, and place additional emphasis on ongoing and preventive care, rather than episodic emergency care.

Although most experts agreed that patients and physicians would likely accept this care approach, a couple of experts suggested that some clinicians may push back because they may see this program as "competition" or may be inconvenienced by phone calls and managing care through EMS personnel. Most experts expressed thoughts that physicians would be grateful for the support in caring for patients and the reduced workload that this program might offer.

Experts suggested that this program may have important cost ramifications. Although costs will increase in the short term as the program is implemented, several experts noted that this initial financial outlay would be recouped over time as inappropriate ED visits, hospitalizations, and readmission are reduced. As one clinical expert noted, this "could have a significant impact on healthcare costs by allowing for less expensive services to be delivered in a home setting rather than an expensive ER."[9]

Intelligent Pills (The Raisin System) to Monitor Patient Medication Adherence

Effective medical therapy for many chronic diseases depends on patient adherence to prescribed medication regimens in the proper sequence, dose, and timing. According to the World Health Organization, however, the average medication adherence rate among patients with chronic diseases in developed nations is only 50%.[12] Therefore, technologies are needed that could improve patient adherence with medication dosages for chronic diseases.

The Raisin System™ (Proteus Biomedical, Inc., Redwood City, CA) is a networked adherence monitoring system intended to aggregate data pertaining to patient medication adherence (and other metrics) into tools that can be used by patients and health care providers.[13] Three main components comprise the system. The ingestible sensor (formerly known as Ingestible Event Marker or IEM) is a 1 mm^2 microfabricated chip sensor that a manufacturer can embed into any oral medication to be swallowed by the patient. The sensor is made of "materials found in the food chain," such as silicon, copper, magnesium, minerals, and cellulose. When the patient swallows the sensor, the chip is released from the medication and activated by stomach fluids, which power the ingestible sensor. Once activated in the body, the sensor transmits digital information regarding the drug taken, its dose, and time of ingestion.[13,14] This information is captured by the system's second component, a wearable personal monitor. After about 7 minutes of activation, the ingestible sensor becomes inactive and is subsequently excreted through fecal elimination. The personal monitor is a wearable, adhesive, soft foam, skin-patch device (measuring 5 by 11 by 1 cm) that records the information sent from the ingestible sensor and that can also be used to measure additional physiological metrics, such as heart rate, respiration, activity, body position, and monitor-wearing compliance. The personal monitor then transmits this information (via Bluetooth telemetry) to a computing device.[14] The monitor, which is battery operated and looks similar to an adhesive bandage, is designed to be worn for 7 days.[14,15] The third component is a mobile phone or Web-based communication platform that is used to view the data transmitted by the ingestible sensor and captured by the personal monitor. The data is sent securely to either the mobile phone or to Web-based platform, where it can be viewed by the patient, family members, caregivers, or health care providers.[14]

According to developers, the intended purpose of this system is: "[T]o confirm the ingestion of individual oral medications and doses, to integrate this adherence data with physiological parameters and wellness metrics, to offer patient-directed sharing of health information with caregivers and providers, and to incorporate individualized behavior support tools."[14] The researchers state that one benefit of the system lies in its ability to give health care providers "improved knowledge of a patient's adherence."[14] With access to objective medication-adherence data, providers will potentially be able to determine whether their clinical management of a patient "should focus upon improving medication adherence, dose adjustment, drug substitution, or polypharmacy."[14]
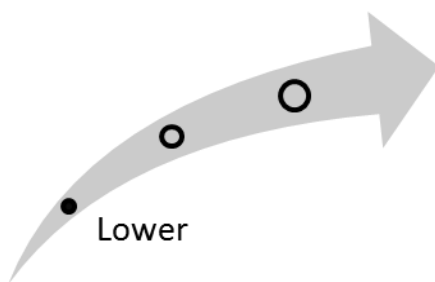
In reporting results of a clinical trial of 111 subjects who ingested 7,144 ingestible markers, investigators published the following: "The system's positive detection accuracy and negative detection accuracy in detecting ingested markers were 97.1% and 97.7%, respectively. It differentiated 100% of multiple drugs and doses taken simultaneously by type and by dose. Medication adherence was >85%. The most common adverse effect was mild skin rash from the monitor's electrodes. No definitive marker-related adverse effects were reported."[14]

In March 2010, the manufacturer received 510(k) clearance from the U.S. Food and Drug Administration (FDA) to market the Raisin Personal Monitor to record heart rate, activity, and patient-logged events.[16] In July 2012, FDA cleared the ingestible sensor technology for marketing in the United States.[17] The company received Conformité Européene (CE) mark approval to market the complete Raisin System, including the ingestible sensor and personal physiologic monitor, in the European Union in August 2010.[18] The system has not yet been commercially marketed in the United States.

Clinical Pathway at Point of This Intervention

The use of this intelligent pill technology would be incorporated into long-term medical management of patients with some forms of chronic disease. Patients would continue to take their medications in the same manner as before, as instructed by their physicians. However, using the personal monitoring technology provided through a "smart" pill is intended to provide physicians with more timely data on how patients are taking their prescribed medications, so they can monitor changes in patients' physiologic parameters in response to their medication use.[19]

Figure 2. Overall high-impact potential: intelligent pills (The Raisin System) to monitor patient medication adherence

Although a couple of experts who commented on this topic remain skeptical about this intervention's potential to improve patient medication adherence and health outcomes, most of the experts commenting generally thought that this intervention could have a significant impact on many health system parameters. These experts also believe more data are needed to properly assess whether this technology will result in improved patient health outcomes. Based on this input, our overall assessment is that this intervention is in the lower end of the high-potential-impact range.

Results and Discussion of Comments

Seven experts, with clinical, research, health systems, and health administration backgrounds, offered perspectives on this intervention.[20-26] These experts agreed that an important unmet need exists for monitoring systems that might improve patient adherence to prescribed medication regimens. One clinical expert mentioned that about 50% of patients with chronic diseases experience prescription adherence issues.[23] One research expert specifically highlighted the fact that prescription nonadherence can result in nearly $300 billion yearly in preventable health care expenses.[25] One clinical/community health expert stated that this intervention might be particularly useful in diseases in which medication adherence has a direct effect on public health, such as in cases of drug-resistant tuberculosis.

The majority of experts were uncertain about this device's potential to improve patient health outcomes, citing a lack of data at this point and uncertainty about its true impact on adherence. These experts are eager to see more and longer-term data to validate these claims.[20-26] One expert

stated that the "active nature" of the intelligent pill could keep patients more engaged in adhering to their drug regimens.[22]

Experts generally agreed this technology is not likely to reduce health disparities, citing per-patient costs associated with this device as one major barrier. In fact, several experts thought this technology has potential to increase disparities. For example, one research expert opined, "Less 'wired' patients (or less tech-friendly) may have a harder time accepting or using this technology.[22] A clinical and community health expert mentioned how this technology would most likely cater to "socially advantaged" populations, stating, "If the systems differentially improved adherences in advantaged populations, health care disparities would probably increase rather than decrease."[20]

Experts speculated that the technology has the potential to affect patient management, although they agreed that the various ways in which clinicians would intervene with patients who do not adhere to treatment recommendations remains to be seen. If the onus of improving patient adherence falls on the provider, staffing needs might increase because staff might need to spend additional time counseling nonadherent patients.

Most experts were not convinced that this technology has potential for wide adoption by patients because the system would not be applicable to all patients and might require much from those who could benefit, hindering patient adoption. One research expert explained, "Given the fact that patients will need to obtain the adherence monitoring system … and wear a personal monitoring device to capture the data transmitted by it, acceptance, at least at first, may not be universal."[25] Several experts cited cost as a potential barrier to patient adoption as well. However, one research expert envisions this device being accepted by elderly patients living alone.[21] In terms of clinician acceptance, most experts agreed clinicians would initially view this technology as a burden, requiring them to spend time on patient monitoring, followup, and education. One clinical expert states, "This innovation may have the [p]otential to drive a wedge in the important clinician-patient relationship. The focus could shift from securing patient understanding and 'buy-in' to a focus on family and friends to coerce the patient into compliance."[24] One research expert explains that although clinician adoption would be unlikely given the added work in analyzing patient data, clinician acceptance could marginally increase if reimbursement for this technology were available.[22]

Most experts suggested the technology would have minimal effect on health care costs, because adoption would be highly selective. One research expert thought that if costs were comparable to this technology's cost in the United Kingdom, roughly $80 per month, impact on health care costs would not be significant.[25] However, another research expert opined that this technology "could potentially have a larger financial impact if more data show it can actually can cut costs by reducing complications through better adherence."[22]

Medical Homes Network to Link Patients in Emergency Departments to Community Care

Emergency departments (EDs) are often used as a safety net for patients who are underinsured or not insured, and who might view the ED as a "substitute for access to primary physician care" and present to the ED with exacerbations of chronic diseases that could be more appropriately managed in the outpatient, primary care setting.[27] The University of Chicago's South Side Medical Homes (SMH) Network is intended to link patients who overuse or misuse the ED with community-based, primary care providers.[27] This model, if proven effective, might serve as a template for other hospital systems facing the same challenges.

The University of Chicago Hospital's (UCH) ED developed the SMH, a care delivery innovation "to connect patients with community-based, primary care providers," and enable them to "build a lasting relationship with a primary care physician in their neighborhoods."[27,28] According to SMH project developers, specific goals of the program include: (1) to build a sustainable safety net system that links patients visiting the ED who lack a "medical home" to community-based primary care; (2) to enhance linkages to community dental, mental health, substance abuse, and other social services; and (3) to strengthen and improve the program through continued self-assessment and patient feedback.[27]

The SMH program was established in 2005 in partnership with local community-based health centers.[27,29] According to program developers, the project's foundation is a collaborative organization between the UCH-ED and 18 community-based health care providers. When patients visit the ED, they are flagged if they are identified as lacking a medical home. ED-based patient advocates (or "navigators") visit these patients, either while the patient is waiting for medical care or before discharge from the ED.[27]

The patient advocates are members of the ED staff who are recruited from the community and trained in the UCH-ED. These advocates seek out flagged patients in the ED and conduct a public-health needs screening that includes the following: (1) an inventory of patient medical problems needing primary care, such as hypertension or diabetes; (2) mental health history; (3) substance abuse status; and (4) current living situation. If the patient's presenting symptoms and acuity level allow, the advocate then "initiates a discussion emphasizing the difference between acute healthcare needs addressed in the ED and preventive healthcare provided by a primary physicians" and offers the patient a primary care referral with one of the partnering community clinics. Most of the referral clinics are staffed by UCH clinicians and are chosen for each patient based on his or her individual needs and neighborhood location.[27] Patients who leave the ED without being seen are contacted by a patient advocate via telephone.[28]

If the patient accepts the referral, appointments are scheduled either immediately or via a followup phone call. To maintain continuity of care, patient ED medical information is either faxed to the community clinic or shared electronically via a recently developed ED Community Portal, which allows community physicians to access the medical records of patients referred from the ED.[28,30] Some of the partnering community health centers reserve certain appointment slots for SMH-referred patients.[28]

Often, the patient advocates identify patients who would benefit from contact with social-work staff. Under the program model, the work of the patient advocates is complemented by the UCH-ED social-work staffers, who provide the following resources to patients in the ED: (1) a brief motivational interview addressing psychosocial needs, substance abuse counseling, and family support networks; (2) outpatient home-health care; and (3) direct nursing home placement.[27]

According to the program's sponsor, in the first 5 years of the program (initiated in 2005), the SMH educated 27,000 patients on the health care resources available in the community and more than half of those patients were successfully connected to primary care doctors on the South Side of Chicago.[29] However, only about 35% of the about 16,000 primary care appointments made through the project were kept by patients.[31] In a 2008 study of the program, which involved 950 patients and 6 patient navigators, published results state: "Data through 01 July 2007 show a monthly average of 950 ED patients surveyed and 80% of these accepting follow-up referral services. Of those patients with ED-scheduled appointments (43%) in community clinics, network data shows patients returning to their referred providers: 39% of patients have been ≥2 times. The navigator role is evolving with the expansion of SMH to include: (1) frequent-user population referrals; (2) preventive health education; and (3) utilization of community resources."[27]
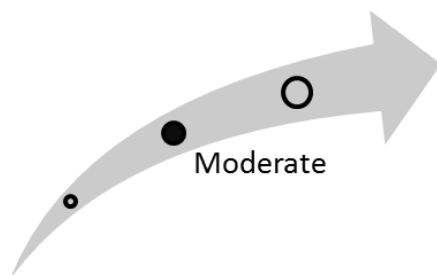
In August 2012, the Commonwealth Fund (New York, NY) issued a brief, highlighting the importance of the Medical Homes Network and other integrated delivery programs in properly addressing the needs of vulnerable and underserved populations.[32]

Current Approach to Care

Chronic, ambulatory-care-sensitive conditions such as alcohol abuse and dependence, bronchitis and asthma, and diabetes are best managed with ongoing care by primary care providers. However, many patients at the UCH-ED present with exacerbations of these conditions; many of these patients might view emergency treatment for these exacerbations as a substitute for ongoing primary care to control the conditions.[27]

The SMH project is intended to link patients to primary care physicians. Therefore, partnerships with community-based health providers are considered important complementary components of this program. If the program is extended to address urgent care needs (as opposed to primary or emergent care), urgent care clinics might also be considered complementary additions to the project. The SMH could be used in tandem with other community-based health outreach programs.

Figure 3. Overall high-impact potential: medical homes network to link patients in emergency departments to community care

Because of the sizable burden of inappropriate ED use on both health care costs and patient health outcomes, experts generally agreed, the unmet need this program is purporting to address is important. Experts suggested that this program might be particularly impactful in improving health disparities and shifting patient care from the ED to the primary setting, where patients might be more appropriately managed over the long term. However, most experts noted that greater patient adherence to the program would be necessary for it to reach its full potential and that more data are needed to determine whether this intervention actually improves patient outcomes. Based on this input, our overall assessment is that this intervention is in the moderate high-potential-impact range.

Results and Discussion of Comments

Seven experts, with clinical, research, and health systems backgrounds, offered perspectives on this intervention.[33-39]

The experts agreed that the need to link ED patients to primary care providers in the community is an important one, especially in light of the negative impact that ED overuse (and community health underuse) has on the health care system (e.g., excessive costs, long wait times) and patient outcomes.

Experts generally thought that this intervention has great potential to improve patient health outcomes by helping patients connect to ongoing appropriate primary care. However, several experts noted that only 35% of patients in the program actually kept their primary care appointments and opined that for this program to reach its full potential, efforts must be made to improve this percentage. Furthermore, some experts mentioned that for full evaluation of this program, data must be collected on how the new primary care relationship actually affects long-term health outcomes for patients.

Most experts thought that this program might have a significant impact on health disparities, particularly because, as one clinical expert pointed out, vulnerable populations (e.g., those of low socioeconomic status and racial or ethnic minorities) are less likely to be well-connected to a primary care physician. Experts generally agreed that this model has the potential to improve access to primary care for patients who inappropriately use the ED and, in turn, improve community health outcomes.

Experts thought that this model might cause moderate disruption to current health care infrastructure and patient management models, but in a generally positive way. Patient care would shift from the ED setting to the primary care setting, where patients could build a relationship with clinicians and be managed over an extended period of time, rather than being treated episodically in the ED. Experts appeared to view these potential changes as a shift back to the way health care was intended to be delivered; as one clinical expert noted, this program "would facilitate the functioning of the existing health care infrastructure rather than disrupt it."[33]

In terms of clinical acceptance, most experts suggested that providers would accept this program, if it is proven to facilitate appropriate care for patients. One clinical expert claims, "Most hospitals and ERs don't want these patient[s] anyway. Presumably the clinics will want more business … ."[39] However, several experts noted that for this program to be readily accepted by physicians, reimbursement policies and administrative work would have to be acceptable to the physicians involved.

Experts' opinions on whether patients would readily adopt this program were divided. Some experts suggested that patients would appreciate the continuity of care and improved outcomes that primary care clinics could provide. Other experts suggested barriers to patient acceptance, including the difficulty of changing patient culture of ED use, the potential inconvenience of long wait times, and transportation issues. Several experts noted that to be adopted by patients, this program would need to address these barriers and ensure that the patient's primary care experience is satisfying.

Most experts agreed that this program is likely to reduce long-term costs of care if ED visits are reduced. Some experts noted that initial costs (to implement the program) would likely be borne by the hospital but that these upfront costs would likely be offset by future savings that might arise from the benefits of preventive care delivered in the primary physician setting.

Partnering Urban Specialists with Rural Primary Care Clinicians for Treatment of Complex, Chronic Conditions

Patients with chronic or complex diseases living in rural or medically underserved areas (e.g., prisons) where specialty care is in short supply or unavailable might experience substandard care because of access barriers, specialist shortages, geographical isolation, and other factors.[40] Project ECHO™ (Extension for Community Healthcare Outcomes) is intended to address the unmet need of access to specialty care by helping primary care clinicians in rural or underserved areas develop more capacity to safely and effectively manage patients in their communities who have chronic, common, and complex diseases.[40]

Project ECHO is a health care delivery model developed at the University of New Mexico (UNM) Health Sciences Center (Albuquerque). It is intended to help develop rural communities' "capacity for safe and effective treatment of chronic, common, and complex disease in rural and underserved areas while monitoring outcomes to ensure quality of care."[40] The program uses telehealth technology and clinical management tools to train and support rural primary care providers in developing knowledge about diseases that would typically fall within the realm of specialty care. According to program developers, this model enables providers to "deliver best-practice care for complex health conditions in federally qualified health centers and other community-based sites where this specialty care was previously unavailable."[40]

Project developers created the model to address the problem of hepatitis C virus (HCV) infection in New Mexico and have used that disease as a framework for describing the model's execution. A partner site (e.g., a rural primary care practice) joins the network, at which point ECHO staff visit the site and conduct an orientation. This orientation includes an explanation of the HCV treatment protocol, the communications technology to be used, and the "case-based presentation format for the weekly 2-hour telemedicine clinics."[40]

Then, clinicians are organized into "disease-specific learning networks that meet weekly via videoconference to present cases." For the HCV model, the specialty team included a hepatologist, a pharmacist, a psychiatrist, and a nurse.[40] Also called "virtual grand rounds" or "teleclinics," these conferences are led by specialists at academic medical centers who review and discuss cases with the rural clinicians and work with them to manage patients' care according to evidence-based protocols.[40,41] The program developers note that the specialists do not assume the care of patients, but instead guide the primary care provider in developing the skills and self-efficacy necessary to treat the patient.[40] Additionally, during the case-based teleclinics, ECHO specialists make brief didactic presentations that are typically relevant to specific issues that arise, with these presentations intended to improve content knowledge.[40,41] Lastly, patient outcomes are monitored through a centralized database.[40]

According to project developers, the model's case-based approach is designed to create a multilevel "learning loop" that allows primary care providers to: (1) "learn by doing," using the guided feedback from specialists; (2) "learn from each other" by interacting with other community-based primary care providers through the network; and (3) "learn from specialists" through the didactic presentations given by ECHO specialists.[40,41]

Project ECHO is under study as a way to improve management of patients with HCV infection or other chronic conditions.[40] In a 2011 trial comparing the treatment of 407 patients with chronic HCV infection (who had received no previous treatment for the infection) at the UNM HCV clinic or by primary care clinicians at ECHO sites in rural areas and prisons in New Mexico, published results state: "A total of 57.5% of the patients treated at the UNM HCV clinic (84 of 146 patients)
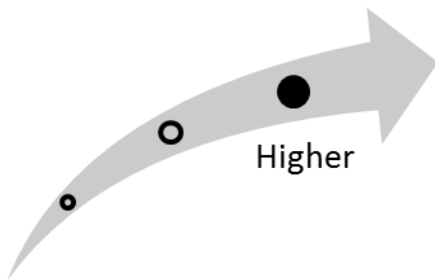
and 58.2% of those treated at ECHO sites (152 of 261 patients) had a sustained viral response (difference in rates between sites, 0.7 percentage points; 95% confidence interval, -9.2 to 10.7; p=0.89). Among patients with HCV genotype 1 infection, the rate of sustained viral response was 45.8% (38 of 83 patients) at the UNM HCV clinic and 49.7% (73 of 147 patients) at ECHO sites (p=0.57). Serious adverse events occurred in 13.7% of the patients at the UNM HCV clinic and in 6.9% of the patients at ECHO site."[41]

As of November 2012, one third-party payer offered reimbursement to primary care providers participating in Project ECHO.[42] Reimbursement for providers by Molina Healthcare of New Mexico is $150 for the presentation of a Molina member to any Project ECHO clinic.[42]

Current Approach to Care

Ideally, chronic, complex diseases (e.g., HCV infection) are treated by specialty care clinicians in academic medical centers or major hospitals.[40] Project ECHO is intended to extend the reach of such specialty care to patients in rural or underserved areas where patients would otherwise face barriers to receiving this care. Because of the program's focus on technologic communication, it might compete with or complement other telemedicine programs, such as those initiated by the Indian Health Service and the Veterans Health Administration, which use telemedicine delivery systems to serve large underserved populations.[43]

Figure 4. Overall high-impact potential: partnering urban specialists with rural primary care clinicians for treatment of complex, chronic conditions

Experts commenting on this intervention agreed that it addresses an important gap in the health care system and is likely to have a significant impact on patient outcomes and access to care in rural areas. Health disparities may be particularly affected, and clinicians and patients alike are expected to accept this program. Some experts suggested that the long-term viability of this program will depend on funding support, either from the government or other sources. Based on this input, our overall assessment is that this intervention is in the higher end of the high-potential-impact range.

Results and Discussion of Comments

Six experts, with clinical, research, and health systems backgrounds, offered perspectives on this program.[44-49] Experts strongly agreed that the unmet need that this intervention purports to address is very important, citing the considerable lack of access to specialty care in rural or otherwise underserved areas compared with other areas. As one clinical expert pointed out, this access gap is likely to become even more pronounced in the future because fewer medical students are choosing to enter primary care practice but recent policy changes will increase the number of patients seeking care.

However, most experts believe that this intervention has potential to improve patient outcomes, based on both the limited trial data available and its underlying theory. Multiple experts pointed out

that although evidence is limited to one trial, the data collected from this trial showed improved patient health outcomes with Project ECHO and may actually show better outcomes than care received in academic medical centers.

Experts agreed that this intervention has potential to dramatically affect health disparities, especially because it is intended to improve access to specialist services for patients with barriers to receiving this care. As one research-based expert stated, "the proposed intervention brings care to patients who otherwise will go without treatment."[44] Furthermore, two experts pointed out that this intervention would provide a mechanism for delivering culturally appropriate care for various subpopulations.

Several experts suggested that this program would have a notable impact on the way patients are managed across several dimensions. First, patients would be able to receive care closer to home and, thus, might be expected to seek care sooner. Additionally, patient volume in rural practices might be expected to increase as more patients participate in the program. However, a couple of experts stated that because the rural physicians would be, to a large degree, providing standard and accepted chronic care, that patient management may not change in terms of care protocols.

Although experts were extremely optimistic about this program's potential to improve access to specialist care for patients in rural areas and its potential to improve health outcomes, several experts also expressed skepticism about the long-term sustainability of the program. Most experts raised the issue of funding and noted that this program will require either government funding or favorable reimbursement policies from third-party payers. Other experts suggested that the initial technology infrastructure, training, and new staffing resources that this program can require will pose a small, but likely not insurmountable, obstacle to diffusion.

Senior-Specific Emergency Departments for Treatment of Elderly Patients

As the U.S. population ages, seniors (i.e., individuals aged 65 years or older) are increasingly seeking care in EDs. However, EDs are not typically optimally equipped to handle the unique needs of this population, and after an ED visit, seniors are at greater risk for medical complications, functional decline, and poor health-related outcomes than before the visit. EDs that are designed to cater specifically to the special needs of the senior population might help address these challenges and improve care for elderly patients in the ED.[50]

Authors from several institutions, including Brookdale Department of Geriatrics and Adult Development at the Mount Sinai School of Medicine (New York, NY) and Holy Cross Hospital (Silver Spring, MD), have described models for senior-specific EDs, which are intended to "use specific interventions to improve patient satisfaction, comfort, and outcomes" in patients who are elderly.[50-52] Although approaches to constructing or repurposing an ED space for seniors varies, one model described by researchers at Brookdale and Mount Sinai illustrates the sort of design and approach (geriatric emergency department interventions [GEDIs]) that a senior-specific ED might entail.[50]

GEDIs can be divided into two main types: structural modification and protocol interventions.[50] (Other authors have described different category dimensions; for example, the Ontario School of Medicine's framework divides interventions into those that address the physical environment, the social climate, hospital policies and procedures, and the health care system.)[53]

According to clinical researchers, structural GEDI modifications that will make an ED more "senior-friendly" include reclining chairs or padded or lined stretchers to improve patient comfort and reduce pressure ulcers; large-faced clocks for improved visibility; calendars; boards with the names of hospital and clinical staff to reduce risk of patient delirium; fall prevention measures such as nonskid floor surfaces, handrails, aisle lighting, and bedside commodes; and visual and lighting aids that might reduce risk for delirium.[50]

Clinical protocols that have the potential to improve senior patient outcomes include screening for cognitive impairment and delirium as part of routine practice, to identify early the patients who are at risk for these conditions and to assist in disposition, treatment, or discharge planning. Also deemed important is routine screening for risk of adverse health outcomes, return visits, or hospitalization; minimizing use of urethral catheters and other "tethering" devices that reduce patient mobility and increase risk of nosocomial infection and delirium; and creating a staff position for a nursing discharge coordinator to improve continuity of care, decrease the need for return visits, and increase patient satisfaction.[50]
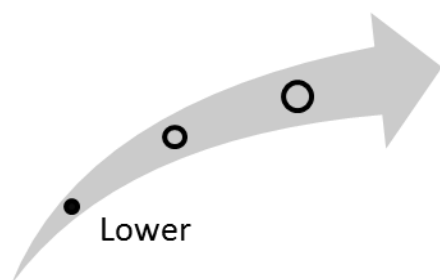
The first "Seniors Emergency Center" implemented in the United States (Holy Cross Hospital, Silver Spring, MD) illustrates how these interventions might be put into practice. The hospital created a separate, enclosed area of the ED specifically designed to meet the needs of seniors. Structural and environmental modifications include the use of special lighting, soft colors, and noise abatement features, handrails, flooring that is less likely to cause falls, thicker bed mattresses, telephones with larger buttons, and speakers in the bed pillows. The hospital also states that the care team at the center includes (in addition to physicians) a geriatric nurse practitioner, registered nurses trained in geriatrics, and a geriatric social worker.[52] The hospital claims that unit staff receive training in both geriatrics and communication with elderly adults.[54]

Current Approach to Care

According to clinical researchers from Brookdale and Mount Sinai, space in the ED is designed for quick patient evaluation and turnover, with a physical layout designed to maximize use of available resources.[50] However, this design poses many risks to the elderly population, including falls. Other design features that might pose a risk to the elderly include the narrow stretchers with thin mattresses that patients lie on while awaiting admission or tests, which increases risk of pressure ulcers; fluorescent lighting and a lack of windows, which promote disorientation in cognitively impaired older adults; and noise from monitor alarms, clinical staff, and other patients, which contributes to worsening delirium and communication difficulties in the potentially hearing-impaired population.[50]

From a clinical point of view, traditional ED practice is not optimally suited for the senior population. For example, rapid triage and diagnosis—hallmarks of ED care—are difficult for older patients, who might have multiple comorbidities, polypharmacy, and functional and cognitive impairments. Clinical researchers state that these challenges, combined with the pressure to make rapid diagnoses, can increase the risk of incorrect or missed diagnoses. Furthermore, in an effort to reduce fall risk and the time and energy devoted to cleaning bedpans or changing diapers, ED staff often insert bladder catheters into this patient population, which increases the risk for developing delirium and infection.[50]

Figure 5. Overall high-impact potential: senior-specific emergency departments for treatment of elderly patients

Lower

Most experts commenting on this intervention agreed that senior-specific ED care represents an important unmet need, that this model might improve outcomes in the target population, and that this innovation might dramatically affect hospital infrastructure and the manner in which patients are managed. However, expert enthusiasm for the model was tempered by the lack of outcomes data and the opinion that all EDs should incorporate these changes for the benefit of the general population, rather than creating a separate ED with the described upgrades. Based on this input, our overall assessment is that this intervention is in the lower end of the high-potential-impact range.

Results and Discussion of Comments

Seven experts, with clinical, research, and health administration backgrounds, offered perspectives on this program.[55-61]

Most of the experts agreed that the need for senior-specific EDs is important, noting that the elderly population is sizable and growing and has multiple medical, social, and psychological needs that might not be identified or addressed in the traditional ED. However, a couple of experts suggested that all EDs could benefit from improvements and that rather than create senior-specific EDs, hospitals might want to consider upgrading general EDs with the interventions described in this report.

Although several experts noted the lack of outcomes data regarding this intervention, most experts appeared optimistic about its potential to improve health outcomes in seniors. This support was based on the opinion that offering senior-specific care is "common sense" and is likely to "have a big health impact by improving patient safety (structural changes), focusing care delivery (protocols), and improve follow-up (staff to assist with discharge planning) of geriatric patients."[56,61] However, some experts suggested that most of these interventions could be implemented in general EDs without creating a separate senior-specific ED and that outcomes for the elderly population would still be expected to improve.

Experts agreed that this intervention will affect health disparities, although they were divided on whether this change would be positive. On one hand, some experts noted that this intervention would likely improve access to and quality of care for seniors visiting an ED. However, other experts expressed concern for worsening disparities, noting that only some hospitals would offer this program, which might widen disparities within the senior population. Furthermore, diverting financial resources to this approach could reduce funds needed to close disparities gaps for other vulnerable populations.

In terms of cost, most experts agreed that creating a senior-specific ED would require a substantial initial cash outlay and that much of this expenditure would be realized through the structural modifications, staff training, and other infrastructure changes that implementing this intervention would require. However, some experts also suggested that hospitals might recoup some of these costs by reducing readmissions through this model. Although some experts expect that this intervention would be readily accepted by seniors who would enjoy being treated in a senior-specific facility, other experts stated that seniors would be unlikely to travel to a senior-specific ED if other EDs are located in closer proximity and that the success of these EDs would require heavy marketing efforts on the part of the hospital.

References

1. Wingrove G, Laine S. Community paramedic: a new expanded EMS model. International Roundtable on Community Paramedicine; 5 p. Also available: http://www.ircp.info/LinkClick.aspx?fileticket=JXIvwjVpihc%3D&tabid=263&mid=754.

2. Community paramedic program handbook. 1.2 ed. Eagle (CO): Western Eagle County Health Services District; 2011 Fall. 48 p. Also available: http://communityparamedic.org/Portals/20/WECAD%20Community%20Paramedic%20Handbook%20Version%201%204.pdf.

3. Helseth C. Community paramedics widen medical services in rural areas. [internet]. Grand Forks (ND): Rural Assistance Center; 2010 Fall [accessed 2011 Oct 27]. [4 p]. Available: http://www.raconline.org/newsletter/fall10/feature.php#story3.

4. Mason S, Knowles E, Colwell B, et al. Effectiveness of paramedic practitioners in attending 999 calls from elderly people in the community: cluster randomised controlled trial. BMJ 2007 Nov 3;335(7626):919. PMID: 17916813

5. Joint Committee on Rural Emergency Care (JCREC). State perspectives discussion paper on development of community paramedic programs. Falls Church (VA): National Association of State Emergency Medical Services Officials, National Organization of State Offices of Rural Health; 2010 Nov. 10 p. Also available: http://www.dphhs.mt.gov/ems/emergency_care/ecc/2010_11_mtng/CP%20Discussion%20Paper%20version%203.pdf.

6. Expert Commenter 340. (External, Clinical). Horizon Scanning Structured Comment Form. HS1299 - Community paramedicine to improve access to care in rural areas. 2011 Dec 27 [review date].

7. Expert Commenter 401. (ECRI Institute, Health Devices). Horizon Scanning Structured Comment Form. HS1299 - Community paramedicine to improve access to care in rural areas. 2012 Apr 26 [review date].

8. Expert Commenter 537. (External, Clinical). Horizon Scanning Structured Comment Form. HS1299 - Community paramedicine to improve access to care in rural areas. 2011 Dec 22 [review date].

9. Expert Commenter 447. (PRI, Health Systems/Administration). Horizon Scanning Structured Comment Form. HS1299 - Community paramedicine to improve access to care in rural areas. 2012 Jan 4 [review date].

10. Expert Commenter 421. (ECRI Institute, Technology Assessment). Horizon Scanning Structured Comment Form. HS1299 - Community paramedicine to improve access to care in rural areas. 2012 Jan 10 [review date].

11. Expert Commenter 400. (ECRI Institute, Applied Solutions Group). Horizon Scanning Structured Comment Form. HS1299 - Community paramedicine to improve access to care in rural areas. 2012 Jan 17 [review date].

12. World Health Organization (WHO). Adherence to long-term therapies. Geneva (Switzerland): World Health Organization (WHO); 2003. 211 p. Also available: http://www.who.int/chp/knowledge/publications/adherence_report/en/.

13. Proteus announces issuance of U.S. patent for ingestible digital devices. [internet]. Redwood City (CA): Proteus Biomedical, Inc.; 2011 Jul 14 [accessed 2012 Apr 3]. [2 p]. Available: http://www.proteusbiomed.com/category/press-releases/.

14. Au-Yeung KY, Moon GD, Robertson TL, et al. Early clinical experience with networked system for promoting patient self-management. Am J Manag Care 2011;17(7):e277-87. PMID: 21819175

15. The chips that are good for your health. Pharmacy to sell edible microchips that will alert doctors if patients are not taking right medicines. [internet]. London: The Independent; 2012 Jan 17 [accessed 2012 Apr 3]. [8 p]. Available: http://www.independent.co.uk/news/science/the-chips-that-are-good-for-your-health-6290700.html.

16. 510(k) summary for Raisin personal monitor [K093976]. [internet]. Washington (DC): U.S. Food and Drug Administration (FDA); 2010 Mar 25 [accessed 2010 Dec 27]. [10 p]. Available: http://www.fda.gov.

17. Proteus Digital Health announces FDA clearance of ingestible sensor. [internet]. Redwood City (CA): Proteus Digital Health; 2012 Jul 30 [accessed 2012 Aug 6]. [2 p]. Available: http://proteusdigitalhealth.com/proteus-digital-health-announces-fda-clearance-of-ingestible-sensor/.

18. Proteus Biomedical announces European CE mark approval of ingestible sensor and monitor system. [internet]. Redwood City (CA): Proteus Biomedical, Inc.; 2010 Aug 13 [accessed 2010 Dec 29]. [2 p]. Available: http://www.proteusbiomed.com/2010/08/13/proteus-biomedical-announces-european-ce-mark-approval-of-ingestible-sensor-and-monitor-system/.

19. Technology. [internet]. Redwood (CA): Proteus Biomedical, Inc. [accessed 2010 Dec 27]. [1 p]. Available: http://www.proteusbiomed.com/technology/.

20. Expert Commenter 145. (External, Clinical). Horizon Scanning Structured Comment Form. HS262 - Intelligent pills (Raisin System) to monitor patient medication use in chronic diseases. 2012 Aug 22 [review date].

21. Expert Commenter 410. (ECRI Institute, Health Devices). Horizon Scanning Structured Comment Form. HS262 - Intelligent pills (Raisin System) to monitor patient medication use in chronic diseases. 2012 Aug 6 [review date].

22. Expert Commenter 418. (ECRI Institute, Technology Assessment). Horizon Scanning Structured Comment Form. HS262 - Intelligent pills (Raisin System) to monitor patient medication use in chronic diseases. 2012 Jul 31 [review date].

23. Expert Commenter 423. (ECRI Institute, Technology Assessment). Horizon Scanning Structured Comment Form. HS262 - Intelligent pills (Raisin System) to monitor patient medication use in chronic diseases. 2012 Jul 31 [review date].

24. Expert Commenter 447. (External, Health Systems/Administration). Horizon Scanning Structured Comment Form. HS262 - Intelligent pills (Raisin System) to monitor patient medication use in chronic diseases. 2012 Aug 31 [review date].

25. Expert Commenter 1175. (ECRI Institute, Applied Solutions Group). Horizon Scanning Structured Comment Form. HS262 - Intelligent pills (Raisin System) to monitor patient medication use in chronic diseases. 2012 Jul 31 [review date].

26. Expert Commenter 1181. (PRI, Research/Scientific/Technical). Horizon Scanning Structured Comment Form. HS262 - Intelligent pills (Raisin System) to monitor patient medication use in chronic diseases. 2012 Aug 15 [review date].

27. Marr AL, Pillow T, Brown S. Southside Medical Homes Network: linking emergency department patients to community care. Prehosp Disaster Med 2008 May-Jun;23(3):282-4. PMID: 18702276

28. Phillips S. Transforming health on the South Side. Med Midway UCMC 2010 Spring/Summer. Also available: http://www.uchospitals.edu/pdf/uch_023753.pdf.

29. The South Side Healthcare Collaborative. [internet]. Chicago (IL): The Urban Health Initiative, University of Chicago Medical Center [accessed 2011 Sep 28]. [2 p]. Available: http://uhi.uchospitals.edu/south-side-healthcare-collaborative.

30. ER community portal project. [internet]. Chicago (IL): The Urban Health Initiative, University of Chicago Medical Center [accessed 2011 Sep 28]. [1 p]. Available: http://uhi.uchospitals.edu/er-community-portal-project.

31. Thomas M. Third of U. of C. patients keep appointments; controversial program struggles with no-shows. Chicago Sun-Times 2010 Jul 30.

32. Including safety-net providers in integrated delivery systems: issues and options for policymakers. Vol. 20. New York (NY): Commonwealth Fund; 2012 Aug. 20 p. (Issue Brief; no. 1617). Also available: http://www.mhnchicago.org/sites/default/files/including_safety_net_providers_in_integrated_delivery_systems_commonwealth_aug_2012_.pdf.

33. Expert Commenter 340. (External, Clinical). Horizon Scanning Structured Comment Form. HS1097 - Medical homes network (South Side Healthcare Collaborative) to link emergency department patients to community care. 2012 Apr 26 [review date].

34. Expert Commenter 444. (PRI, Health Systems/Administration). Horizon Scanning Structured Comment Form. HS1097 - Medical homes network (South Side Healthcare Collaborative) to link emergency department patients to community care. 2012 Apr 19 [review date].

35. Expert Commenter 421. (ECRI Institute, Technology Assessment). Horizon Scanning Structured Comment Form. HS1097 - Medical homes network (South Side Healthcare Collaborative) to link emergency department patients to community care. 2012 Apr 10 [review date].

36. Expert Commenter 397. (ECRI Institute, Applied Solutions Group). Horizon Scanning Structured Comment Form. HS1097 - Medical homes network (South Side Healthcare Collaborative) to link emergency department patients to community care. 2012 Apr 10 [review date].

37. Expert Commenter 547. (External, Clinical). Horizon Scanning Structured Comment Form. HS1097 - Medical homes network (South Side Healthcare Collaborative) to link emergency department patients to community care. 2012 Apr 25 [review date].

38. Expert Commenter 1016. (ECRI Institute, Health Devices). Horizon Scanning Structured Comment Form. HS1097 - Medical homes network (South Side Healthcare Collaborative) to link emergency department patients to community care. 2012 Apr 10 [review date].

39. Expert Commenter 1026. (ECRI Institute, Technology Assessment). Horizon Scanning Structured Comment Form. HS1097 - Medical homes network (South Side Healthcare Collaborative) to link emergency department patients to community care. 2012 Jul 31 [review date].

40. Arora S, Kalishman S, Dion D, et al. Partnering urban academic medical centers and rural primary care clinicians to provide complex chronic disease care. Health Aff (Millwood) 2011 Jun;30(6):1176-84. Epub 2011 May 19. Also available: http://content.healthaffairs.org/content/early/2011/05/17/hlthaff.2011.0278.full. PMID: 21596757

41. Arora S, Thornton K, Murata G, et al. Outcomes of treatment for hepatitis C virus infection by primary care providers. N Engl J Med 2011 Jun 9;364(23):2199-207. Epub 2011 Jun 1. PMID: 21631316

42. Molina Health Care partners with Project ECHO. [internet]. Albuquerque (NM): University of New Mexico School of Medicine [accessed 2012 Feb 21]. [2 p]. Available: http://echo.unm.edu/providers-partners/Molina.html.

43. Sequist TD. Ensuring equal access to specialty care. N Engl J Med 2011 Jun 9;364(23):2258-9. Epub 2011 Jun 1. PMID: 21631317

44. Expert Commenter 771. (External, Health Systems/Administration). Horizon Scanning Structured Comment Form. HS1069 - Partnering urban academic medical centers and rural primary care clinicans for treatment of complex chronic diseases. 2012 Apr 19 [review date].

45. Expert Commenter 537. (External, Health Systems/Administration). Horizon Scanning Structured Comment Form. HS1069 - Partnering urban academic medical centers and rural primary care clinicans for treatment of complex chronic diseases. 2012 Apr 19 [review date].

46. Expert Commenter 403. (ECRI Institute, Health Devices). Horizon Scanning Structured Comment Form. HS1069 - Partnering urban academic medical centers and rural primary care clinicans for treatment of complex chronic diseases. 2012 Apr 19 [review date].

47. Expert Commenter 398. (ECRI Institute, Applied Solutions Group). Horizon Scanning Structured Comment Form. HS1069 - Partnering urban academic medical centers and rural primary care clinicans for treatment of complex chronic diseases. 2012 Apr 23 [review date].

48. Expert Commenter 1029. (PRI, Clinical). Horizon Scanning Structured Comment Form. HS1069 - Partnering urban academic medical centers and rural primary care clinicans for treatment of complex chronic diseases. 2012 Apr 19 [review date].

49. Expert Commenter 1026. (ECRI Institute, Technology Assessment). Horizon Scanning Structured Comment Form. HS1069 - Partnering urban academic medical centers and rural primary care clinicans for treatment of complex chronic diseases. 2012 Jul 31 [review date].

50. Hwang U, Morrison RS. The geriatric emergency department. J Am Geriatr Soc 2007 Nov;55(11):1873-6. PMID: 17916122

51. Rosenberg M, Rosenberg L. Improving outcomes of elderly patients presenting to the emergency department. Ann Emerg Med 2011 Nov;58(5):479-81. Epub 2011 Aug 4. PMID: 21816510

52. Seniors emergency center. [internet]. Silver Spring (MD): Holy Cross Hospital [accessed 2011 Oct 3]. [1 p]. Available: http://www.holycrosshealth.org/seniors-emergency-center.

53. Kelley ML, Parke B, Jokinen N, et al. Senior-friendly emergency department care: an environmental assessment. J Health Serv Res Policy 2011 Jan;16(1):6-12. PMID: 20660532

54. Baker B. A Silver Spring ER aims to serve older patients. [internet]. Washington (DC): The Washington Post; 2009 Jan 27 [accessed 2011 Oct 3]. [3 p]. Available: http://www.washingtonpost.com/wp-dyn/content/article/2009/01/26/AR2009012601872.html.

55. Expert Commenter 537. (External, Clinical). Horizon Scanning Structured Comment Form. HS1253 - Senior-specific emergency departments for treatment of elderly patients. 2012 Apr 2 [review date].

56. Expert Commenter 421. (ECRI Institute, Technology Assessment). Horizon Scanning Structured Comment Form. HS1253 - Senior-specific emergency departments for treatment of elderly patients. 2012 Apr 13 [review date].

57. Expert Commenter 397. (ECRI Institute, Applied Solutions Group). Horizon Scanning Structured Comment Form. HS1253 - Senior-specific emergency departments for treatment of elderly patients. 2012 Apr 10 [review date].

58. Expert Commenter 659. (External, Clinical). Horizon Scanning Structured Comment Form. HS1253 - Senior-specific emergency departments for treatment of elderly patients. 2012 Apr 23 [review date].

59. Expert Commenter 1174. (ECRI Institute, Health Devices). Horizon Scanning Structured Comment Form. HS1253 - Senior-specific emergency departments for treatment of elderly patients. 2012 Apr 10 [review date].

60. Expert Commenter 429. (ECRI Institute, Technology Assessment). Horizon Scanning Structured Comment Form. HS1253 - Senior-specific emergency departments for treatment of elderly patients. 2012 Apr 10 [review date].

61. Expert Commenter 938. (External, Health Systems/Administration). Horizon Scanning Structured Comment Form. HS1253 - Senior-specific emergency departments for treatment of elderly patients. 2012 Apr 19 [review date].